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EXAMINER
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ALEJANDRO MULERO, LUZ L

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* TUQIANG NI, FRANK Y. LIN, CHUNG-HO HUANG, and  
WEINAN JIANG

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Appeal 2010-000520  
Application 09/821,753  
Technology Center 1700

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Before CHARLES F. WARREN, CATHERINE Q. TIMM, and  
PETER F. KRATZ, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge TIMM*.

Opinion Concurring-In-Part and Dissenting-In-Part filed by *Administrative Patent KRATZ*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

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<sup>1</sup> The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the “MAIL DATE” (paper delivery mode) or the “NOTIFICATION DATE” (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

## I. STATEMENT OF CASE

Appellants appeal under 35 U.S.C. § 134 from the Examiner’s decision to reject claims 38-66. We have jurisdiction under 35 U.S.C. § 6(b).<sup>2</sup>

We AFFIRM.

Appellants’ invention relates to a method of processing a workpiece in a vacuum processor chamber by gradually changing, on a programmed basis, power that an AC plasma excitation source supplies to a plasma (Spec. 1:2-5). Claims 42, 47, 50, and 54 are illustrative:

42. A method of forming a rounded corner of a trench of a workpiece in a vacuum plasma chamber, comprising

converting a gas species that is supplied to the chamber into an etchant plasma that is continuously applied to the workpiece while the rounded corner is being formed,

gradually changing the power applied to the etchant plasma while the rounded corner is being formed, the gradual changes being such that the power does not remain constant for

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<sup>2</sup> We decide this appeal based on the Appeal Brief filed January 22, 2008, and Supplemental Appeal Brief filed July 9, 2008; the Reply Brief filed January 13, 2009, and Supplemental Reply Brief filed July 6, 2009; and the Supplemental Examiner’s Answer mailed May 5, 2009. Appellants’ “Motions to Strike” the Supplemental Examiner’s Answer and a previous Examiner’s Response to Arguments (Motions of July 6, 2009 and March 26, 2009) essentially request the exercise of the supervisory authority of the Director but are not styled as petitions under 37 C.F.R. § 1.181. Matters that are petitionable are not before a merits panel for review on appeal. See Manual of Patent Examining Procedure § 1002.02(c)3 (8th ed., Rev. 2, May 2004) and § 1201 (8th ed., Rev. 3, August 2005). See also, e.g., *In re Berger*, 279 F.3d 975, 984-85 (Fed. Cir. 2002) (Issues regarding whether an examiner abused his or her discretion in matters of practice and procedure are not subject to appeal). Therefore, we do not address these Motions.

durations in excess of one second while the rounded corner is being formed, and,

while the rounded corner is being formed, maintaining constant: (a) the flow rate of the gas species into the chamber and (b) the species flowing into the chamber.

47. A method of etching a workpiece in a vacuum plasma processor chamber comprising

converting a gas species into an AC etchant plasma that is applied to the workpiece while a desired shape of the workpiece is being formed, the AC etchant plasma always being the dominant material applied to the workpiece while the desired shape is being formed,

the vacuum chamber being subject to operating at different pressures while the workpiece is being processed, the gas species being subject to flowing into the chamber at different flow rates while the workpiece is being processed,

gradually changing, on a pre-programmed basis, the amount of AC power supplied to the plasma during etching of the workpiece to form the desired shape,

wherein a gradual transition in the shape of material that has the desired shape in the workpiece being processed occurs in response to the gradual power change, the gradual power change occurring during the gradual transition in the shape of the material that has the desired shape.

50. The method of claim 48 wherein the species is ionized into a plasma that etches the material to form the desired shape,

the gradual power change, the species and the continuous application of the plasma to the workpiece being such that the material is shaped to have a curved surface,

the curved surface being formed in response to changes in the ionized plasma etchant resulting from the gradual power change.

54. The method of claim 49 wherein the gradual change includes steps having power changes no greater than about several watts, the power remaining at a constant wattage for no more than about 1 second.

(Claims 42, 47, 50, and 54 (indentations added).)

The Examiner maintains, and Appellants seek review of, the following rejections:

1. The rejection of claims 47-66 under 35 U.S.C. § 112, first paragraph as lacking written descriptive support;
2. The rejection of claims 38-46 under 35 U.S.C. § 103(a) as unpatentable over Chao (US 2002/0106845 A1; published Aug. 8, 2002);
3. The rejection of claims 47-66 under 35 U.S.C. § 103(a) as unpatentable over Bhardwaj (US 6,051,503; issued Apr. 18, 2000) in view of Howald (WO 00/58992; published Oct. 5, 2000);
4. The rejection of claims 47-66 under 35 U.S.C. § 103(a) as unpatentable over Chao.<sup>3</sup>

Appellants present arguments with respect to each of the rejections separately.

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<sup>3</sup> The rejection of claims 47-66 as obvious over Chao is made for the first time in the Answer of November 13, 2008, and is designated a new ground of rejection (Supp. Ans. 8). Appellants reply to this new ground in the Reply Brief of January 13, 2009.

## II. WRITTEN DESCRIPTIVE SUPPORT

With respect to the first rejection, Appellants focus their arguments on the particular claim limitation at issue that is common to both independent claims (claims 47 and 59). Therefore, we decide this Appeal on the basis of representative independent claim 47 for the first rejection.

### A. ISSUE ON APPEAL

A first issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support the Appellants' view that Appellants' Specification provides written descriptive support for the "the AC etchant plasma always being the dominant material applied to the workpiece while the desired shape is being formed," as recited in claim 47? We answer this question in the affirmative.

### B. DISCUSSION

Appellants contend that the description in Appellants' Specification stating that "[d]uring the 15 second final etch operation . . . a suitable mixture of HBr/O<sub>2</sub> constantly flows from sources 68 into chamber 40, while the power that amplifier 132 supplies to electrode 56 gradually decreases from 200 to 100 watts" (Spec. 16:27-17:2) provides sufficient written descriptive support for the claimed limitation (Br. 11). Appellants provide declaration evidence indicating that one of ordinary skill in the art would interpret the statement to mean that the HBr etchant is always dominant over the O<sub>2</sub> passivation gas because etching continues to occur during the process (Br. 12<sup>4</sup>; June 5, 2006 Bailey Decl. ¶ spanning p. 3-4 (Item 3(h)); May 17,

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<sup>4</sup> In the Official record, facsimile identification lines have rendered the actual page numbers of Appellants' Brief unidentifiable. Accordingly, we reference the facsimile page numbers printed in the upper right hand corner of each page of Appellants' Brief for convenience.

2007 Bailey Decl. ¶ spanning p. 2-3 (Item 3(b)). Otherwise, the material in the passivation gas deposited on the workpiece would have a greater effect on the material than the etchant gas, and etching would not occur (*id.*).

The Examiner contends that Appellants' Specification discloses more than one etching step and does not disclose that an etchant plasma is always the dominant material for all of the etching steps (Supp. Ans. 8). According to the Examiner, "there is no written description for the absolute limitation of the etchant material always being the dominant material since clearly the rounded corners can be formed if the etchant material is not the dominant material one hundred percent of the time" (Supp. Ans. 8).

"The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language." *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983).

Appellants' declaration evidence, indicating that the etchant gas must be predominant for etching to occur as opposed to passivation, is reasonable. Though the Examiner has found that the rounded corners can be formed even if the etchant material is not the dominant material one hundred percent of the time, the Examiner directs us to no evidence in the record to support this contradictory finding. Thus, the weight of the evidence taken as a whole supports the Appellants' declaration evidence. Based on Appellants' evidence, we are persuaded that Appellants' Specification would have conveyed with reasonable clarity to one of ordinary skill in the art that, as of

the filing date sought, Appellants were in possession of a process in which an etchant gas is always dominant while the desired shape is being formed.

We agree with Appellants that the Examiner's focus on other etching steps is misplaced (*see* Reply Br. 8-9), since it is only the final etch in Appellants' Specification that includes the gradual reduction in power recited in the claims. Thus, the fact that Appellants disclose other etching steps is of no moment.

Accordingly, we cannot sustain the Examiner's rejection based on a lack of written descriptive support.

### III. OBVIOUSNESS – CHAO

For convenience, we consolidate the rejection of claims 47-66, added as a new ground of rejection in the Examiner's Answer (Supp. Ans. 8), with the rejection of claims 38-46, as both rejections are based on the same prior art reference and as Appellants present substantially similar arguments in addressing the teachings of the Chao reference in each rejection.

#### A. ISSUES ON APPEAL

A second issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support Appellants' view that the Examiner erred in concluding that it would have been obvious to one of ordinary skill in the art to gradually change the amount of power being supplied to the plasma during an etching process based on the teachings of Chao? We answer this question in the negative.

A third issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support Appellants' view that the Examiner erred in concluding that the particular parameters for "gradually changing" the power, e.g., the time and amount of each power step, would

have been obvious to one of ordinary skill in the art based on the teachings of Chao? We answer this question in the negative.

## B. DISCUSSION

Chao teaches rounding the bottom corners 216 of the trench using a bottom-corner-rounding (BCR) etch process step (step 208) (Chao, ¶ [0048]). It is undisputed that Chao teaches a relationship between power supplied to the BCR etch plasma and the amount of rounding that occurs. Specifically, Chao states that

The ideal duration of BCR process varies from one application to another and is determined experimentally for each application. Generally, the ideal duration is inversely proportional to the flow rate of SF<sub>6</sub>. The duration of BCR process may be set by performing the process for a predetermined time, or using an end-point detection or other forms of in-situ monitoring system. Generally, increasing the source power, increasing the chamber pressure, increasing the flow rate of SF<sub>6</sub> or CF<sub>4</sub>, all increase the amount of rounding occurring at the bottom corners.

(Chao, ¶ [0049]).

The Examiner determines that, based on the disclosed relationship, it would have been routine to alter the source power while the etching is taking place to achieve a desired profile of the corner (Supp. Ans. 5 and 11).

Appellants contend that paragraphs 0048 and 0049 of Chao do not disclose increasing the power during the etching process, i.e., while the rounded corner is being made (Br. 13-14; Reply Br. 3 and 10). Appellants contend that Chao suggests increasing the source power prior to the corner being formed and that such a power increase results in an increased corner rounding over the power level applied in the previous etching step (Br. 13; Reply Br. 3-4).

An obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). “A person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 421.

The Examiner has clearly established that a relationship between increased power and increased corner rounding was known in the art. We note that Chao also teaches “in-situ monitoring” (see Chao ¶¶ [0028] and [0049]). Thus, it would have been routine for the skilled artisan to exploit the known relationship between power and contour to make the appropriate adjustments in power during the etching process (i.e., to regulate the power) to arrive at a desired degree of rounded corner. Based on the known relationship, the skilled artisan would have obtained predictable changes in contour whether altering the power prior to etching or altering the power in-situ. Appellants have provided no evidence or rationale to show that making such alterations in power in-situ, as opposed to prior to the etching step, would have generated unexpected results in the shape of the rounded corner.

We agree with Appellants and our dissenting colleague that Chao does not expressly teach changing the power during etching. However, as pointed out by the Examiner, Chao teaches that increasing power increases rounding (Supp. Ans. 8; Chao, ¶ [0049]). The disclosed power/rounding relationship provides evidence that the result of changing power levels during the etching step would have been understood to have predictable effects on rounding of the bottom corners, and changing the power during the etching step to obtain the predictable effect on rounding would have been within the skill of the

ordinary artisan. We determine that the evidence supports the obviousness conclusion of the Examiner.

Appellants also contend that Chao also does not suggest the specific amounts and/or frequency of power change recited in the claims (Br. 14-15; Reply Br. 7-8 and 10).

The Examiner contends that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum amount of time at which the power should remain constant and the optimum amount the power is changed, to achieve the desired rounded profile of the trench” (Supp. Ans. 5-6).

Optimization of a variable which is recognized in the prior art to be a result effective variable would ordinarily be within the skill in the art. *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980); *see also In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (“where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”).

The prior art clearly establishes that power is a variable that can be adjusted to achieve a desired degree of rounding. Accordingly, a skilled artisan would have optimized the degree of power change to arrive at a desired contour by routine experimentation.

It is true that a routine variable change sometimes causes an unexpected effect. In such a situation, the claimed subject matter will be unobvious under the law if Appellants present a showing of criticality of the range for unexpected beneficial results. *See In re Boesch*, 617 F.2d at 276 (CCPA 1980). Appellants have provided no evidence to show that the

particularly claimed power and time changes produce a degree of rounding which would not have been expected by the skilled artisan.

Appellants also contend that Chao teaches a corner etching process which is “a chemical process” (Br. 13; Reply Br. 3).

However, we find it of no moment that Chao describes the etching process as “a chemical process.” Chao states that “[t]he BCR process rounds the bottom corners using primarily a chemical process. The process includes exposing the substrate to a plasma formed from a process gas” (Chao, ¶ [0048]). Chao also teaches that power is supplied “to ignite a plasma having ions, electrons and radicals from the process gas” (Chao, ¶ [0050]). In other words, Chao does not teach that the bottom rounding etch of Chao takes place merely by exposing the substrate to the process gas. Rather, Chao teaches that a power source is required to ignite a plasma from the process gas.

Appellants also contend that Chao’s teaching of an additional soft etching step is sufficient evidence of non-obviousness (Br. 15; Reply Br. 6-7 and 10-11). According to Appellants, such a soft etching step is unnecessary in the present invention because the sharp demarcations do not occur in the rounded corners when the power is gradually changed (*id.*). Appellants include declaration evidence to show that when a gradual power change was used to form a rounded corner, a subsequent soft etch was not needed (Br. 15-16; Kamp Decl. ¶ [0004]).

The Examiner contends that the open language of the claims does not exclude an additional soft etch step (Supp. Ans. 12-13).

We find Appellants’ position unpersuasive of nonobviousness. Chao’s teaching of an additional soft etch step does not negate the

knowledge of the skilled artisan provided by the disclosed relationship between and increase in power and the amount of rounding that occurs at the corner.

Moreover, Chao clearly teaches that a soft etch is not necessary if alternative parameter changes are made, particularly reducing the flow rate of the etchant to remove the damaged outer surfaces of the trench (Chao, ¶ [0058]). As such, there is sufficient evidence in the record to suggest that the need for a soft etch is not dependent upon gradual changes in the power supply, as suggested by Appellants, but rather in the flow rate of the etchant. We are unwilling to accept Appellants' arguments when contradictory evidence is already of record, without additional evidence of nonobviousness.

Further, we find the Kamp Declaration to be unpersuasive of nonobviousness. While Kamp describes performing an etch in which the power was gradually changed and no subsequent soft etch was necessary (Kamp Decl. ¶ [0004]), Kamp does not declare that the particular etch process that Kamp performed was an etch falling within the scope of the claimed invention. Kamp fails to provide any particular parameters used during the etch so as to distinguish the etching process over that which would have been suggested by the prior art.

The weight of the evidence taken as a whole supports the Examiner's conclusion of obvious under the law.

#### IV. OBVIOUSNESS – BHARDWAJ AND HOWLAND

Initially, Appellants' arguments are directed to limitations common to independent claims 47 and 59 (Br. 17-19), for which we select claim 47 as a representative claim. Appellants then argue that the cited references alone

or together do not disclose or suggest that the “desired shape” of Appellants’ independent claims have the “curved” or “rounded corner” shapes specifically recited in claims 50-53 and 62-64 (Br. 20-21). The issues raised for claims 50-53 and 62-64 are the same. Appellants then argue that the cited references alone or together do not disclose or suggest the particular parameters for gradually changing the power specifically recited in claims 54-58, 65, and 66 (Br. 21-22). The issues raised for claims 54-58, 65, and 66 are the same.

#### A. ISSUES ON APPEAL

A fourth issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support Appellants’ view that the Examiner erred in concluding that the process of claim 47, in which the etchant plasma is always the dominant material applied to the workpiece while the desired shape is being formed, would have been obvious to one of ordinary skill in the art based on an etching step disclosed in Bhardwaj? We answer this question in the negative.

A fifth issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support Appellants’ view that the Examiner erred in finding that Bhardwaj inherently teaches the formation of a rounded bottom corner, as would fall within the scope of claims 50-53 and 62-64? We answer this question in the negative.

A sixth issue on appeal arising from the contentions of Appellants and the Examiner is: does the evidence support Appellants’ view that the Examiner erred in concluding that the specific parameters by which the power is gradually changed, as recited in claims 54-58, 65, and 66, would

have been obvious to one of ordinary skill in the art based on the teachings of Bhardwaj? We answer this question in the affirmative.

**B. DISCUSSION**

Appellants contend that Bhardwaj does not teach that an etchant plasma is always the dominant material during etching of the “desired shape,” as recited in claim 47. Rather, according to Appellants, Bhardwaj teaches that the trench wall is the “desired shape,” which is formed by alternating etchant and deposition steps in periods of less than 7.5 seconds. Appellants assert that the deposition gas cannot be swept out of the trench before the etchant gas is applied. (Br. 17-18; Reply Br. 11.) Appellants include declaration evidence to show the advantages of maintaining a gas species constant while a desired shape is being formed and the problems associated with alternately supplying etchant and passivation gases to the workpiece (Br. 19; *see* May 17, 2007 Bailey Decl. pp. 3-5 (Items 4 and 5)).

The Examiner contends that the “desired shape,” as recited in claim 47, is not limited to any specific shape and, thus, is broad enough to read on a portion of the trench wall that is etched during a single etching step. The addition of a subsequent deposition step and additional etching and deposition steps are not excluded from a broadest reasonable interpretation of the claim. (Supp. Ans. 13 and 14).

During examination, “claims . . . are to be given their broadest reasonable interpretation consistent with the specification, and . . . claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art.” *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) (*quoting In re Bond*, 910 F.2d 831, 833 (Fed. Cir. 1990)).

We agree with the Examiner’s interpretation of claim 47. The term “desired shape” is not defined by Appellants’ Specification and is sufficiently broad to read on any shape that is made while etching, such as the shape that would likely occur during a single etching step along a trench wall. Thus, Appellants’ arguments, which are based on an interpretation in which only the entire trench wall of Bhardwaj constitutes the recited “desired shape,” fail to refute the Examiner’s rejection based on a reasonable interpretation of the claims.

We agree with the Examiner that during a single etching step, the etchant plasma is always the dominant material. Bhardwaj teaches that the etching and deposition gas flows may be continuous (such that the flow rates vary in a sinusoidal, out of phase pattern) or that the gas flows may be “abruptly variable” (Bhardwaj, col. 1, l. 66-col. 2, l. 2). If the gas flows are abruptly varied, only the etchant gas will be supplied during the etching step. Bhardwaj also teaches that a pump out time of less than 1.5 seconds is sufficient and that “it is desirable to prevent a mixing of the deposition and etch step gases” (Bhardwaj, col. 6, ll. 22-24).

Further, we find the May 17, 2007, Bailey Declaration to be unpersuasive of nonobviousness. As with Appellants’ arguments, the Bailey Declaration starts with the proposition that the “desired shape” is the entire trench wall which requires both etching and deposition steps, rather than merely a portion of a trench wall, as properly interpreted by the Examiner, the etching of which requires only a single etching step (*see* May 17, 2007, Bailey Decl., pp. 3-5 (Items 4 and 5)).

Appellants do not refute the Examiner’s finding that Bhardwaj teaches a gradual change in power during a single etching step (*see generally* Br. 17-

19). Rather, Appellants arguments are all directed to the fact that Bhardwaj teaches alternating etching and deposition steps.

Accordingly, the weight of the evidence taken as a whole supports the Examiner's conclusion that claim 47 is obvious under the law.

Appellants' arguments for claims 48-49 and 60-61 are based on the same reasoning asserted with respect to claim 47, i.e., that forming a trench wall requires both etching and deposition steps (Br. 20). For the same reason discussed above, the weight of the evidence taken as a whole supports the Examiner's conclusion that claims 48-49 and 60-61 are obvious under the law.

Claims 50-53 and 62-64 are directed to the "desired shape" being a curved surface, particularly a rounded corner at the intersection of a wall and a base of the trench. The Examiner contends that the gradual power change taught by Bhardwaj will inherently produce a rounded profile when applied to a bottom corner of the trench, since a similar gradual power change in the instant application produces a rounded profile (Supp. Ans. 6-7). The Examiner also contends that the phrases "curved" and "rounded" are relative terms, which are not specifically defined by the Specification or claims (Supp. Ans. 15).

Appellants contend that rounded corners are not necessarily formed by the Bhardwaj method, since Bhardwaj does not disclose an AC etchant plasma is always the dominant material applied while the desired shape is being formed, i.e., the process taught by Bhardwaj is not the same process claimed by Appellants (Br. 18-19 and 20-21). Appellants also contend that the SEMs of Figures 12, 14, 17, and 18 show trenches produced by the

Bhardwaj process that do not have rounded corners at the intersection of the walls and bases of the trenches (Br. 19).

When a claimed product appears to be substantially identical to a product disclosed by the prior art, the burden is on the Applicants to prove that the product of the prior art does not necessarily or inherently possess characteristics or properties attributed to the claimed product. *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990).

The Examiner has found that the claimed invention is substantially identical to a single etching step taught by Bhardwaj, in that Bhardwaj teaches a gradual power change and the continuous application of etchant plasma to the workpiece during a single etching step (Supp. Ans. 6). Thus, the burden shifts to Appellants to show that rounded corners are not inherently formed when an etching step of Bhardwaj is used at the bottom of the trench.

Again, Appellants do not refute the Examiner's finding that Bhardwaj teaches a gradual change in power during a single etching step (*see generally* Br. 17-19). Rather, Appellants' arguments are all directed to the fact that Bhardwaj teaches alternating etching and deposition steps. Thus, Appellants' argument, that Bhardwaj's process is different because there is a change in the gas species due to the alternate flow of etchant plasma and deposition plasma (Br. 20), fails to address the Examiner's reliance on a single etching step, as discussed in detail above.

Further, we disagree with Appellants that the SEM images of Figures 12, 14, 17, and 18 fail to disclose rounded corners at the intersection of the walls and bases of the trenches. We agree with the Examiner that the terms "curved" and "rounded" are not sufficiently defined and would read on any

degree of curvature or rounding, i.e., anything other than an exact right angle. The SEM images of Bhardwaj are not of sufficient resolution at the bottom corners to discern a clear right angle is present at the bottom corners of the various trenches. Thus, we are not persuaded that some degree of rounding is not present at the bottom corners of the SEM images.

Accordingly, the weight of the evidence taken as a whole supports the Examiner's conclusion that claims 50-53 and 62-64 are obviousness under the law.

Claims 54-58, 65, and 66 are directed to specific parameters by which the power is gradually changed. The Examiner contends that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum amount of time at which the power should remain constant and the optimum amount the power is change, *to achieve the desired rounded profile of the trench*" (Supp. Ans. 8) (emphasis added).

Appellants contend that the Examiner points to nothing in Bhardwaj to indicate there was an appreciation of a relationship between the desired workpiece shape and the amplitude and/or duration of step changes in the amount of power applied to the plasma (Br. 22).

We agree with the Appellants. Unlike the teachings of Chao discussed above, Bhardwaj does not disclose a relationship between the disclosed gradual power change and a rounded corner shape. The Examiner has provided no evidence from the teachings of Bhardwaj to show that one of ordinary skill in the art would have recognized that the disclosed gradual power change would have been a variable that could be manipulated to affect a rounded profile. Thus, the Examiner's rationale for why one of

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ordinary skill in the art would have optimized the amplitude and duration of a power change is not supported by the teachings of Bhardwaj.

The Examiner's application of the teachings of Howald does not cure the deficiencies of the Examiner's application of Bhardwaj.

#### IV. CONCLUSION

On the record before us and for the reasons discussed above, we do not sustain the rejection of claims 47-66 under 35 U.S.C. § 112, first paragraph, as lacking written descriptive support or the rejection of claims 54-58, 65, and 66 under 35 U.S.C. § 103(a) as unpatentable over Bhardwaj in view of Howald. We do sustain the remaining rejections of claim 38-66 maintained by the Examiner.

#### V. DECISION

We affirm the Examiner's decision.

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VI. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

KRATZ, *Administrative Patent Judge*, Concurring-In-Part, Dissenting-In-Part.

I concur with the majority decision to reverse: (1) the Examiner’s decision rejecting claims 47-66 under 35 U.S.C. § 112, first paragraph as lacking written descriptive support; and, (2) the Examiner’s decision rejecting claims 54-58, 65, and 66 under 35 U.S.C. § 103(a) over Bhardwaj in view of Howald.

However, I respectfully dissent from the majority decision to affirm: (1) the Examiner’s decision rejecting claims 38-46 under 35 U.S.C. § 103(a) over Chao; (2) the Examiner’s decision rejecting claims 47-66 under 35 U.S.C. § 103(a) over Chao (new ground); and (3) the Examiner’s decision rejecting claims 47-53 and 59-64 over Bhardwaj in view of Howald.<sup>5</sup>

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<sup>5</sup> I agree with the majority’s decision to decide this appeal on the basis of the Examiner’s Answer mailed May 05, 2009 subsequent to a Board Remand (returning undocketed appeal to the Examiner). The May 05, 2009 Answer is, in effect, a Substitute Examiner’s Answer albeit identified as a Supplemental Examiner’s Answer (Supp. Ans.) in the PTO-90C Form accompanying the mailing. Moreover, I agree with the majority’s decision to consider the Appeal Brief (App. Br.) filed January 22, 2008 together with the revised Appeal Brief sections submitted July 9, 2008 and the Reply Brief (Reply Br.) filed January 13, 2009, and the Reply Brief filed July 06, 2009 in deciding this appeal. The majority notes that Appellants’ motions to strike were not styled as petitions and the majority does not address these motions. It is my opinion that at least the second such motion to strike the Examiner’s Answer mailed May 05, 2009 is an improper motion and both motions are moot. In this regard, Appellants chose to continue with the appeal by filing Reply Briefs rather than requesting reopening of prosecution before the Examiner after receipt of the Examiner’s Answers introducing a new ground of rejection therein. Appellants had opportunity to and have responded to the Answers and the Examiner’s rejection positions. This panel has appropriately determined the Briefs and Answer before us in rendering this Decision. Of course, the Examiner’s Final Office action

Concerning the Examiner’s rejections over Chao, I agree with Appellants that the Examiner erred in asserting that Chao shows “changing the power applied to the etchant plasma while the rounded corner is being formed” and that “Chao et al. shows the process substantially as claimed including . . . gradually changing, the amount of AC power supplied to the plasma during etching of the workpiece to form the desired shape . . .” (Supp. Ans. 4 and 7; Chao, paras. 0048 and 0049, and Fig. 4D).<sup>6</sup> Rather, a fair reading of the relied on portions of Chao in light of the teachings of Chao as a whole reveals that Chao, in relevant part, notes that an increase in the power (source 105) is one of several variables that affects the amount of rounding (increased power increases rounding). As Appellants correctly argue, Chao says nothing, and certainly the Examiner has not shown otherwise, about gradually changing AC power (increasing or otherwise adjusting the power via pre-programming) to the plasma during the etching of the bottom corner to increase rounding or to otherwise form a desired shape as here claimed (App. Br. 13-16; Reply Br. 2-8 and 10). Rather, Chao basically reports that employing a higher source power level for a BCR etch generally results in increases in rounding whereas if the source power level applied was lower, a decrease in the etch rate and an increase of etch uniformity would accrue (paras. 0049 and 0050). The Examiner does not

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rejecting the pending claims from which appeal was taken is also part of this appeal record.

<sup>6</sup> The Examiner does not fully articulate the Examiner’s assessment of the scope of claim 59, which is drawn to a memory storing a program, as well as the claims depending thereon, in presenting the rejections in the Final Office Action and the Examiner’s Answer. Thus, the latter claims are considered together with correspondingly rejected method claim 47 and the claims

establish that Chao teaches changing the source power supplied while a BCR etch is being conducted much less so in a gradual manner as claimed at herein.

Moreover, concerning the claimed relative term “gradual” in terms of power changes, the Specification instructs that AC power changes to the plasma greater than about five percent of maximum power output during etching are too steep to achieve the desired workpiece shapes and etching with unchanged power duration of greater than about one second does not achieve the desired workpiece shapes (Spec. 6). Hence, when the claims are properly read in light of the Specification, such steep power changes or long duration lack of power change are disavowed from being within the scope of the claimed gradual power changes during etching to achieve the workpiece shape.

As such, the Examiner’s assertion of the obviousness, through routine experimentation, for one of ordinary skill in the art to determine the manner in which the power is changed to arrive at the claimed gradual power change during etching is premised on an incorrect reading of Chao. In this regard and as noted above, the Examiner has not established that Chao teaches or shows changing the source power during the BCR etch. Nor does the Examiner establish that Chao teaches or suggests gradually changing the source power during the BCR etch. Thus, the Examiner has not shown that Chao would have led one of ordinary skill in the art to experiment with and determine a level of source power change or gradualness of source power changing during a BCR etch that corresponds with that claimed by

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depending thereon in my consideration of the propriety of the Examiner’s rejections on this appeal record.

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Appellants. In other words, the Examiner has not shown that Chao identifies source power changing during etching and/or the rate of change of source power during a BCR etch, as result effective parameters that should be optimized for the bottom corner rounding taught by Chao. Hence, the Examiner fails to establish the obviousness of the claimed subject matter over Chao for reasons stated in the Appeal Brief and Reply Briefs before us.

Regarding the Examiner's obviousness rejection of claims 47-53 and 59-64 over Bhardwaj in view of Howald, which is affirmed by the majority herein, it is my opinion that the Examiner similarly errs in overstating what is actually disclosed and taught by Bhardwaj and in understating or failing to fully address or appreciate what is claimed at herein and what the secondary evidence shows for reasons stated in the Appeal Brief.

In my view, Appellants have indicated reversible error in the rejections as presented by the Examiner on this appeal record. Therefore, I would reverse all of the rejections as maintained by the Examiner.

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